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U. S. DEPARTMENT OF COMMERCE
DANIEL C. ROPER, Secretary
BUREAU OF FISHERIES
FRANK T. BELL, Commissioner

Administrative Report No. 33

PROPAGATION AND DISTRIBUTION OF FOOD FISHES

FISCAL YEAR 1937

By GLEN C. LEACH and M. C. JAMES

APPENDIX IV TO REPORT OF COMMISSIONER OF FISHERIES
FOR THE FISCAL YEAR 1937

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ADMINISTRATIVE REPORT SERIES

Since the advent of the Administrative Report Series, considerable confusion has arisen concerning its system of numbering the separates composing it. Inasmuch as the Reports of the Divisions vary in order from year to year, many have found their designations as "Appendix No. I, II, III, or IV" very confusing. To relieve this, it has been decided to number them as "Administrative Report No. —." Inasmuch as 20 separates had already been printed in this series before starting the numbers, it was deemed advisable to begin the numbering with Administrative Report No. 21. Of course, numbers cannot be printed on those already off the press, but for the information of those who wish to know what the first 20 were, they are numbered for filing purposes as follows:

No. 1. Report, Commissioner of Fisheries, 1931.
No. 2. Alaska Fishery and Fur-Seal Industries, 1930.
No. 3. Fishery Industries of the United States, 1930.
No. 4. Progress in Biological Inquiries, 1930.
No. 5. Propagation and Distribution of Food Fishes, 1931.
No. 6. Report Commissioner of Fisheries, 1932.
No. 7. Alaska Fishery and Fur-Seal Industries, 1931.
No. 8. Fishery Industries of the United States, 1931.
No. 9. Progress in Biological Inquiries, 1931.
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No. 11. Alaska Fishery and Fur-Seal Industries, 1932.
No. 12. Progress in Biological Inquiries, 1932.
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No. 16. Alaska Fishery and Fur-Seal Industries, 1933.
No. 17. Progress in Biological Inquiries, 1933.
No. 18. Propagation and Distribution of Food Fishes, 1934.
No. 19. Alaska Fishery and Fur-Seal Industries, 1934.
No. 20. Fishery Industries of the United States, 1934.

Note that the last Commissioner's Report was for 1932. Since then its place has been taken by a reprint from the Report of the Secretary of Commerce under the title "Bureau of Fisheries." Inasmuch as it is no longer a Bureau publication, it is not numbered; but it will be supplied to any who request the Report of the Commissioner for any year since 1932.

PROPAGATION AND DISTRIBUTION OF FOOD FISHES, FISCAL YEAR 1937 [1]

By GLEN C. LEACH, *Chief*, and M. C. JAMES, *Assistant Chief, Division of Fish Culture*

CONTENTS

	Page
Introduction	461
Species propagated	462
Production	464
Construction activities	465
Cooperation with other conservation agencies	466
Salvage operations	467
Assignments of fish and fish eggs to States, Territories, and foreign countries	468
Transfer of eggs between stations	471
Station output	473
Egg collections	479
Notes on operations	480
Commercial species	480
Marine species	481
Great Lakes species	482
Anadromous species, Atlantic coast	482
Game-fish propagation	483
Rocky Mountain territory	483
New England trout stations	485
Combination trout and pondfish stations	486
Pondfish stations	487
Mississippi River territory	488
Aquarium	489
Distribution operations	490
Summary, by States, of fish distribution	490

INTRODUCTION

The record level of hatchery production attained during the fiscal year 1936 was subject to a slight recession in 1937. The decline from a total of 8,170,000,000 fish and eggs to 7,919,000,000 was relatively insignificant for an enterprise which is influenced by many outside factors and is consequently liable to noticeable fluctuation in production.

At the present time conservationists and sportsmen are greatly interested in the development of stream-improvement work and the conduct of stream surveys, both intended to provide a more rational policy of stocking the streams and lakes. These studies have resulted in detailed and elaborate stocking programs for thousands of miles of public waters. The promulgation of such programs emphasizes even more strongly the vital role of the hatcheries in maintaining sport fishing. The most carefully designed plan for fish stocking and conservation is utterly useless without the raw material in the form

[1] Administrative Report No. 33, Appendix IV to the Report of the U. S. Commissioner of Fisheries for 1937. Approved for publication Nov. 1, 1938.

of young fish, which must be derived from the hatcheries. An increasing percentage of the output of game fish from Federal hatcheries has gone to streams which have been studied, charted, and planned as to their carrying capacity, food resources, etc.

Hatchery policies have been frequently subjected to change throughout the past years, although the mechanics and technique of the propagation work itself has changed remarkably little.

A few years ago there was wide public acceptance of the belief that game fish should be planted at legal or adult size. It is now realized that in certain sections such practice is absolutely essential, whereas elsewhere the planting of smaller fingerlings will give thoroughly satisfactory results.

In the earlier days of hatchery operations strenuous effort was made to secure the greatest possible hatch of the various commercial species, both marine and fresh water. This did not stem depletion. In many instances the policy of hatching for the sake of hatching alone was abandoned. The modern conception of artificial propagation of commercial species is to obtain and hatch eggs which would otherwise be destroyed in prosecuting a commercial fishery. The fry resulting from these eggs are a byproduct recovery and the hatcheries do not reach further and attempt to secure eggs which would be hatched naturally and normally if the brood fish remained undisturbed.

The foregoing comments are made to illustrate the fact that the hatcheries, the original agencies of Federal fish conservation, are being kept in step with new developments and conditions.

It may also be pointed out that both sportsmen and commercial fishing interests frequently call for the establishment of new hatcheries, either by the States or by the Federal Government. It is incontestibly true that in certain sections additional hatching facilities are urgently needed. There are limits to the economic justification for an indiscriminate establishment of new hatcheries, however, and good policy requires that many requests for such hatcheries be discouraged. Fish should be propagated in areas where natural conditions afford the best facilities for successful hatchery work and also where the stream mileage, lake or pond acreage, and intensity of fishing presupposes a real need. In many instances what is needed is not a new hatchery but additional rearing facilities for a supply of fish which may be shipped in from existing hatcheries.

SPECIES PROPAGATED

The Federal hatcheries are distributing practically all of the game and pan fishes which are of importance to the angler. The list of commercial species of fish propagated is somewhat more restricted because of the fact that many of these forms have characteristics which render them unsuited for artificial propagation methods, at least as a practical economic measure. The propagation of commercial species must always be based upon an abundant egg supply which can be collected for incubation at a reasonable unit cost. During 1937, 45 separate species were handled at the hatcheries in comparison with 43 utilized during the previous year.

The most important change was the resumption of the hatching of striped bass in North Carolina, in cooperation with the North Carolina Fish and Game Department.

Glut herring and white perch were again hatched, this work being conducted according to the availability of eggs from season to season. The hatching of lobsters was also resumed, being carried on at three marine stations located in New England.

There follows a list of the species propagated, together with a more condensed summary of the numbers distributed:

CATFISHES (SILURIDAE):
- Catfish (*Leptops olivaris*).
- Spotted channel catfish (*Ictalurus punctatus*).
- Horned pout (*Ameiurus nebulosus*).

CARP (CYPRINIDAE): Common carp (*Cyprinus carpio*).
BUFFALOFISH (CATOSTOMIDAE): Common buffalo (*Ictiobus sp.*).
SHAD AND HERRING (CLUPEIDAE):
- Shad (*Alosa sapidissima*).
- Glut herring (*Pomolobus aestivalis*).

SALMONS, TROUTS, AND WHITEFISHES (SALMONIDAE):
- Common whitefish (*Coregonus clupeaformis*).
- Lake herring, cisco (*Leucichthys sp.*).
- Chinook, king or quinnat salmon (*Oncorhynchus tschawytscha*).
- Chum salmon (*Oncorhynchus keta*).
- Coho salmon, silver salmon (*Oncorhynchus kisutch*).
- Red salmon, sockeye, or blueback salmon (*Oncorhynchus nerka*).
- Steelhead trout (*Salmo gairdneri*).
- Atlantic salmon (*Salmo salar*).
- Landlocked salmon (*Salmo sebago*).
- Rainbow trout (*Salmo shasta*).
- Black-spotted trout, redthroat trout (*Salmo lewisi*).
- Brown or Loch Leven trout (*Salmo fario var.*).
- Lake trout, Mackinaw trout (*Cristivomer namaycush*).
- Brook trout (*Salvelinus fontinalis*).

GRAYLING (THYMALLIDAE): Montana grayling (*Thymallus montanus*).
PIKES (ESOCIDAE): Pike and pickerel (*Esox sp.*).
SUNFISHES (CENTRARCHIDAE):
- Crappie (*Pomoxis annularis* and *P. sparoides*).
- Largemouth black bass (*Micropterus salmoides*).
- Smallmouth black bass (*Micropterus dolomieu*).
- Rock bass (*Ambloplites rupestris*).
- Warmouth bass (*Chaenobryttus gulosus*).
- Bluegill sunfish (*Lepomis incisor*).
- Green sunfish (*Lepomis cyanellus*).
- Redbreasted bream (*Lepomis auritus*).
- Red-eared sunfish (*Lepomis heros*).
- Common sunfish (*Lepomis gibbosus*).
- Rio Grande perch (*Herichthys cyanoguttatus*).

PERCHES (PERCIDAE):
- Pike perch (*Stizostedion vitreum*).
- Yellow perch, ringed perch (*Perca flavescens*).

WHITE BASSES (SERRANIDAE):
- White bass (*Roccus chrysops*).
- Striped bass (*Roccus lineatus*).
- White perch (*Morone americana*).

DRUMS (SCIAENIDAE): Fresh-water drum, lake sheepshead (*Aplodinotus grunniens*).
CODS (GADIDAE):
- Cod (*Gadus callarias*).
- Haddock (*Melanogrammus aeglefinus*).
- Pollock (*Pollachius virens*).

FLOUNDERS (PLEURONECTIDAE): Winter flounder, American flatfish.
MACKEREL (SCOMBRIDAE): Common mackerel (*Scomber scombrus*).
LOBSTER (HOMARIDAE): Lobster (*Homarus americanus*).

Summary, by species, of the output of fish and fish eggs during the fiscal year ending June 30, 1937

Species	Eggs	Fry	Fingerlings	Total
Catfish			21,178,900	21,178,900
Buffalofish	329,250,000		3,660,800	332,910,800
Carp	163,500,000		2,788,500	166,288,500
Shad		18,413,000		18,413,000
Whitefish	2,280,000	86,255,000		88,535,000
Lake herring		160,000		160,000
Glut herring		12,500,000		12,500,000
Striped bass		641,000		641,000
Chinook salmon	22,425,000		29,967,450	52,392,450
Chum salmon		17,405,500		17,405,500
Silver salmon		612,000	1,445,600	2,057,600
Sockeye salmon	1,250,000	2,000,000	2,810,500	6,060,500
Sockeye salmon, landlocked			112,350	112,350
Steelhead trout	125,000		1,446,100	1,571,100
Atlantic salmon			10,000	10,000
Landlocked salmon			59,500	59,500
Rainbow trout	3,883,550	358,400	9,033,950	13,275,900
Blackspotted trout	10,437,100		10,630,500	21,067,600
Loch Leven trout	5,132,600	1,186,875	3,404,275	9,723,750
Lake trout		599,100	254,600	853,700
Brook trout	3,384,000	2,343,320	15,217,480	20,944,800
Grayling	1,543,000	1,470,040	7,460	3,020,500
Pike and pickerel			122,750	122,750
Crappie			9,826,700	9,826,700
Black bass, largemouth		2,050,500	5,153,300	7,203,800
smallmouth		660,000	231,400	891,400
Rock bass			171,500	171,500
Warmouth bass			23,100	23,100
Sunfish			16,766,150	16,766,150
Pike perch	6,400,000	221,695,000		228,095,000
Yellow perch	14,250,000	240,263,000	125,400	254,638,400
Freshwater drum			45,100	45,100
White bass			95,650	95,650
White perch		2,500,000		2,500,000
Miscellaneous fish			1,632,000	1,632,000
Mackerel		8,833,000		8,833,000
Cod	2,670,717,750	162,832,900		2,833,550,650
Haddock	750,855,600			750,855,600
Flatfish (flounder)	12,473,900	1,466,108,200		1,478,582,100
Pollock	961,413,600	571,409,650		1,532,823,250
Lobster		3,261,500		3,261,500
Total	4,959,321,100	2,823,557,985	136,221,015	7,919,100,100

PRODUCTION

The recession in output below the figures of last year was distributed throughout several groups of species. The Pacific coast salmon, with the exception of the chum salmon and steelhead trout, were produced in lesser numbers. The game trouts, particularly the rainbow, blackspotted, and Loch Leven, were likewise available in lesser quantities. There was considerable regression in the number of pike, perch, and yellow perch distributed. Increases were registered for both the shad and whitefish. Among the marine species the haddock and pollock, totaling over two and a quarter billion eggs and fry, showed an increase, with a drop for the flounder and cod. The moderate curtailment in the production of the game trout, the Pacific salmon, and some of the pan fish, such as sunfish, was reflected in a reduction in the output of fingerlings and the larger sized fish. While over 136 million of these fish were put out in sizes ranging from 1 inch to legal size, this represented a shortage of 14 million in comparison with the previous year.

The strictly game fish comprised approximately 126 million of the total output. It is frequently difficult to inculcate in the public mind the reason for this discrepancy in the number of game fish distributed in comparison with the commercial and semicommercial varieties. The explanation lies largely in the fact that the latter are distributed as newly hatched fry or sometimes as fertilized eggs, whereas, the game

varieties are retained and fed at the hatcheries for periods ranging from several months to a year or more. Furthermore, the distribution of these larger fish involves heavy costs and this feature makes it necessary to restrict the hatchery production to a level which will permit the proper handling of the fish in distribution under the funds available for this purpose.

Hatchery production can be increased to a limited degree by more efficient methods and more intensive utilization of existing facilities. Any marked increase in production must be based upon an expansion of hatchery facilities, either through the establishment of new hatcheries or enlargement of the capacity of the older establishments. Hatchery production is also somewhat at the mercy of weather conditions and other factors, which accounts for a year-to-year variation.

The Louisville, Ky., hatchery was completely inundated during the winter floods in that section, but the damage was overcome and a moderate production of fish was achieved during the spring. This accounted for a curtailment in the production of smallmouth bass, but the yield of largemouth bass was brought to 7,200,000, a figure exceeding any previous output by the Bureau.

CONSTRUCTION ACTIVITIES

No new work was undertaken during the year, except that at the close of the fiscal year a new project at Carson, Wash., in the Columbia National Forest was just being started. This was provided for by a special appropriation of $60,000 and was necessitated by the fact that the pool created by the Bonneville Dam will seriously affect operations at the Little White Salmon, Wash., substation. The new project was designed to offset the reduction of putput which was anticipated at the Little White Salmon unit.

During the year a W. P. A. development at the Uvalde, Tex., station was carried on and was virtually completed on June 30. The Smokemont, N. C., hatchery, located in the Smoky Mountain National Park, was likewise completed under W. P. A. auspices.

Somewhat extensive work in the nature of enlargement and improvement was carried on by the W. P. A. at several other locations. The San Angelo, Tex., station, partially developed, was improved so that it is now a complete producing unit. Throughout the year a small force was at work enlarging the pond system of the Rochester, Ind., hatchery. At Lake Mills, Wis., general improvements were being made while the pond system was also extended. The Bureau's program for the construction of culture ponds in the Upper Mississippi Wild Life Refuge was furthered by a project under way at Genoa, Wis., where a large acreage is being developed. Lesser improvements were made at the Spearfish, S. Dak., station and several other establishments.

C. C. C. assistance was obtained in a number of instances, the most outstanding of which was the continuation of the long-range development plan at the York Pond, N. H., station. At Lamar, Pa., a small detail of these workers was engaged in general improvements. At Walhalla, S. C., the hatchery building and rearing ponds were completed, but the installation of equipment for the former was not accomplished. It was not possible to construct any dwellings at this point.

Naturally, where a number of the field stations are over 35 years old there is constant requirement for ordinary maintenance and upkeep work, but current appropriations for this activity being limited, it is evident that deterioration is progressing rapidly at some of the older stations, and that special provision will have to be given to the rehabilitation of such hatcheries as the ones at White Sulphur Springs, W. Va., and Hartsville, Mass.

The Bureau selected a location in a Resettlement Administration area in Rhode Island for the establishment of a bass hatchery with the expectation of developing it by means of an appropriation made a number of years ago, and which still continues available. While tentative arrangements were satisfactory, the question of formal transfer of the desired site had not been settled at the close of the year and no active construction was started.

COOPERATION WITH OTHER CONSERVATION AGENCIES

As far as matters of fisheries conservation are concerned many of the objectives sought by reorganization of the executive agencies of the Government are now attained by practical working agreements. Federal agencies primarily interested in restocking, or other types of fisheries conservation activities, are: The United States Forest Service, National Park Service, and, to a lesser degree, the Reclamation Service, Office of Indian Affairs, Tennessee Valley Authority, and the Farm Security Administration.

The Bureau's contacts with the first two agencies are governed by definite written agreements whereby stocking and other activities on the lands under their control are performed in conformity with a mutually agreeable program. Informal contacts exist with the other Federal agencies and in specific instances where cooperation or coordination has appeared advisable, such has been reached by negotiations.

The Bureau is constantly increasing the proportion of fish or fish eggs assigned to waters under the control of the Forest Service and Park Service. In the former case, rearing ponds have been constructed in a number of the forests, to which small fish from Federal hatcheries are transferred for rearing and subsequent release. Where these nurseries have been of sufficient size, the Bureau has assigned employees to take care of the fish, and has met the costs of food, etc. In brief, where there has been developed a program of recreational use for Federal lands, and angling has been a part of the program, the Bureau of Fisheries has entered the picture as the principal Federal agency capable of providing such angling. Both the Tennessee Valley Authority and the Farm Security Administration have constructed fish hatcheries, the operation of which has been taken over by the Bureau. The Bureau has further cooperated by rendering technical advice and recommendations for other fisheries conservation projects in which the foregoing agencies were interested.

Coordination with the conservation work of other non-Federal agencies is likewise a cardinal objective in the activities of the Division of Fish Culture. Frequent conferences and meetings have been held with officials of the various State game and fish departments through meetings of the National Planning Council of Fish and Game Commissioners. These meetings have largely progressed beyond the point of mere agreement to agree, and have resulted in concrete,

definite arrangements for coordinating hatchery work, distribution of fish, and many of the other details affecting the conservation of game and commercial fish.

Additional States, particularly Pennsylvania, have undertaken to review Federal fish applications for waters within their territory, in order to assure planting of the proper species. In a number of instances, the State authorities have undertaken to actually distribute the fish produced by Federal hatcheries or rescue stations.

The Bureau has been able to assign a number of carloads of fish at the request of the North Dakota and South Dakota fish and game authorities for the provision of initial stock in new lakes and reservoirs created in those States. As usual, surplus trout eggs produced at the Federal hatcheries have been largely allocated to the States, sometimes on an exchange basis. In several instances Bureau employees have been assigned to render technical assistance in connection with problems which confronted State authorities. This has been exemplified in the case of Georgia and Arkansas particularly. In New York State arrangement has been made whereby the Bureau's hatchery employees in that area join in periodic conferences, or schools, which the State holds for its own employees. It should suffice to point out that both among the administrative personnel and the field staff there is a definite will for mutual cooperative action in conducting activities pertaining to fish culture and stocking. This inevitably results in a multitude of informal minor agreements facilitating the work of both agencies.

As has been previously indicated, cooperation with private sportsmen's organizations through the assignment of fish to nurseries or rearing pools is gradually receding. This is not due to the question of the value of such work, but is based upon the fact that State authorities, being more familiar with local conditions, are better able to furnish the necessary supervision and technical guidance to these nurseries. The Bureau lacks the extensive field force and the funds for travel which would be essential in supervising a far-flung system of cooperative nurseries. The Bureau has endeavored to cooperate with the sportsmen's groups, both national organizations and the smaller local clubs, by furnishing expert technical advice relative to their problems, surveying their areas wherever possible, and demonstrating the possibilities of improving angling through concerted local private effort.

SALVAGE OPERATIONS

In accordance with the regular procedure, the collecting stations located at various points on the Upper Mississippi River were in operation during the late summer. Seining crews were sent out by truck, launch, and houseboat for the purpose of salvaging stranded fish. The extent of this work is dependent upon river conditions, rainfall, and other local factors, as well as available funds. During 1937 conditions were somewhat more favorable for rescue work and a total of 50,572,000 fish were handled, which is an increase of approximately 7,000,000 over last year. The tabulations appearing below indicate the principal species handled, and the relative proportion of each which was used for distribution to other sections. The miscellaneous fish reported under this heading include various minnows and shiners, considered as forage fish, as well as other native varieties picked up in limited quantities.

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Reference has been made previously to the fact that artificial ponds are used to produce fish within the refuge in addition to the large quantities obtained in rescue work. Construction work on several of these ponds continued throughout the year and they have demonstrated a high rate of productivity which promises a highly valuable yield of game fish when rescue work is discontinued, as it will be shortly, due to canalization of the river.

It will be noted that crappie and sunfish were most abundant among the fish rescued from the landlocked overflow pools of the Mississippi, and bass were comparatively scarce.

Number and disposition of fish rescued, fiscal year 1937

Locality and species	Delivered to applicants	Restored to original waters	Total number of fish rescued
All stations:			
Black bass	107,337	381,140	488,477
Buffalofish		3,660,775	3,660,775
Carp		2,788,575	2,788,575
Catfish	89,820	20,835,150	20,924,970
Crappie	85,035	9,653,855	9,738,890
Drum		45,000	45,000
Pike-pickerel		123,155	123,155
Sunfish	149,607	10,811,060	10,960,667
White bass		95,650	95,650
Yellow perch	5,725	108,575	114,300
Miscellaneous fishes		1,631,940	1,631,940
Total	437,524	50,134,875	50,572,399
Summary by stations:			
La Crosse	162,852	1,724,055	1,886,907
Homer	79,440	4,338,265	4,417,705
Marquette	150,447	28,478,160	28,628,607
Bellevue	7,300	9,075,835	9,083,135
Lynxville	22,035	5,898,230	5,920,265
Upper Mississippi River Refuge		223,100	223,100
Fairport	15,450	397,230	412,680
Total	437,524	50,134,875	50,572,399

ASSIGNMENTS OF FISH AND FISH EGGS TO STATES, TERRITORIES, AND FOREIGN COUNTRIES

There were 162,801,475 fish and eggs assigned to the various States, either by direct delivery or by distribution to the credit of the State. The differential in comparison with the 639,000,000 listed under the same category last year is due to the fact that the production of pike-perch at the Put-in-Bay, Ohio, station is no longer listed as an assignment to the State. This hatchery is now operated on a joint basis with the Division of Fish and Game of the State of Ohio and its output of pike perch, totaling, on an average, around 500,000,000, cannot be considered as a direct contribution of the Federal Government.

Thirty-nine States shared in the production of the Federal hatcheries, in comparison with 32 in the previous year. Approximately half of these assignments consisted of eggs, principally of the various species of trout. In many instances the capacity of the Federal hatcheries is insufficient to take care of all of the trout eggs secured, in which case the logical procedure is to transfer them to State hatcheries. In some sections, particularly in Indiana, where the available mileage of trout waters is limited, the State is relieved of the necessity of propagating trout through arrangements whereby they may be obtained from Federal hatcheries located in other States. A new

departure was the assignment of flatfish or flounder fry to the State of Rhode Island.

Assignments of fish and fish eggs to State fish commissions, fiscal year 1937

States and species	Eggs	Fry	Fingerlings, etc.	Total
Alabama:				
Black bass, largemouth			19,180	19,180
Sunfish (bream)			1,034,200	1,034,200
Arizona:				
Brook trout	502,000			502,000
Loch Leven trout	200,340			200,340
Largemouth black bass			15,000	15,000
Arkansas: Largemouth black bass			36,000	36,000
Colorado: Loch Leven trout	1,000,700			1,000,700
Connecticut:				
Loch Leven trout	100,100			100,100
Smallmouth black bass		269,000		269,000
Georgia:				
Black bass, largemouth			4,470	4,470
Catfish			85,275	85,275
Loch Leven trout	100,100			100,100
Rainbow trout	250,000			250,000
Sunfish			152,230	152,230
Idaho:				
Blackspotted trout	4,301,520		192,800	4,494,320
Brook trout			97,480	97,480
Grayling	506,000			506,000
Loch Leven trout	122,000			122,000
Rainbow trout			389,300	389,300
Illinois: Sunfish			12,000	12,000
Indiana:				
Black bass, largemouth			25,150	25,150
Brook trout			89,590	89,590
Loch Leven trout			91,850	91,850
Rainbow trout			72,720	72,720
Sunfish			4,340	4,340
Iowa:				
Loch Leven trout	40,000			40,000
Rainbow trout	26,700	10,000	13,500	50,200
Sunfish			2,500	2,500
Kentucky: Black bass, smallmouth		40,000		40,000
Maine: Brook trout		150,000	389,000	539,000
Maryland:				
Sunfish			3,000	3,000
Yellow perch		1,871,000		1,871,000
Massachusetts:				
Loch Leven trout	100,100			100,100
Rainbow Trout	198,000			198,000
Michigan:				
Black bass, smallmouth			10,000	10,000
Rainbow trout	250,000			250,000
Mississippi: Sunfish			41,650	41,650
Montana:				
Black bass, largemouth			58,980	58,980
Blackspotted trout	1,536,040			1,536,040
Catfish			5,100	5,100
Crappie			21,590	21,590
Loch Leven trout	1,000,640			1,000,640
Rainbow trout	100,170		83,400	183,570
Nebraska:				
Brook trout			49,350	49,350
Loch Leven trout			23,800	23,800
Rainbow trout			71,600	71,600
Nevada: Rainbow trout	500,000			500,000
New Hampshire:				
Brook trout	500,000	356,000	52,600	908,600
Lake trout		21,450		21,450
New Jersey: Flatfish		28,682,000		28,682,000
New Mexico:				
Black bass, largemouth			497,200	497,200
Blackspotted trout	500,000			500,000
Catfish			5,500	5,500
Loch Leven trout	50,350			50,350
Sunfish			264,900	264,900
New York: Rainbow trout			20,000	20,000
North Carolina:				
Black bass, largemouth			500	500
Brook trout			128,450	128,450
Catfish			240	240
Loch Leven trout	200,500			200,500
Rainbow trout	1,674,500		104,500	1,779,000
Smallmouth black bass			1,680	1,680
Sunfish			57,200	57,200

Assignments of fish and fish eggs to State fish commissions, fiscal year 1937—Contd.

States and species	Eggs	Fry	Fingerlings, etc.	Total
North Dakota:				
Black bass, largemouth			68,825	68,825
Crappie			8,740	8,740
Ohio: Rainbow trout			25,000	25,000
Oregon:				
Blackspotted trout	800,000			800,000
Brook trout			632,500	632,500
Chinook salmon	12,900,000			12,900,000
Grayling	506,000			506,000
Loch Leven trout	690,000		107,800	797,800
Rainbow trout			65,000	65,000
Silver salmon			260,000	260,000
Steelhead trout			10,000	10,000
Pennsylvania: Rainbow trout			10,365	10,365
Rhode Island:				
Rainbow trout	20,000			20,000
Flatfish		49,768,000		49,768,000
South Carolina:				
Brook trout			63,000	63,000
Black bass, largemouth			19,190	19,190
Rainbow trout	400,000		20,000	420,000
Sunfish			11,215	11,215
Yellow perch			20	20
South Dakota:				
Black bass, largemouth			11,470	11,470
Blackspotted trout			52,900	52,900
Brook trout			55,800	55,800
Catfish			10,000	10,000
Crappie			14,075	14,075
Rainbow trout			8,000	8,000
Rock bass			1,100	1,100
Sunfish			19,440	19,440
Tennessee:				
Loch Leven trout			33,000	33,000
Rainbow trout	295,000		25,000	320,000
Utah:				
Brook trout	302,000		155,250	457,250
Grayling	506,000			506,000
Vermont:				
Brook trout	500,000	795,000	7,500	1,302,500
Chinook salmon	25,000			25,000
Lake trout		130,640		130,640
Landlocked salmon			3,000	3,000
Pike perch	6,400,000			6,400,000
Rainbow trout			15,000	15,000
Yellow perch	14,250,000			14,250,000
Virginia:				
Rainbow trout			110,230	110,230
Yellow perch		16,000,000		16,000,000
Washington:				
Blackspotted trout	425,000		59,250	484,250
Brook trout			34,500	34,500
Rainbow trout			202,700	202,700
Sockeye salmon	1,250,000	816,000		2,066,000
West Virginia:				
Brook trout	1,014,000		688,450	1,702,450
Black bass, largemouth			950	950
Loch Leven trout	500,000			500,000
Rock bass			7,800	7,800
Sunfish			34,800	34,800
Rainbow trout			494,820	494,820
Wisconsin:				
Catfish			35,625	35,625
Crappie			19,250	19,250
Grayling	25,000			25,000
Rainbow trout	52,700			52,700
Sunfish			40,000	40,000
Wyoming:				
Blackspotted trout	1,000,000		14,000	1,014,000
Brook trout			83,325	83,325
Grayling			450	450
Loch Leven trout	315,640			315,640
Rainbow trout	150,000		39,120	189,120
Total	56,086,100	98,909,090	7,806,285	162,801,475

There was a resumption in the shipment of fish and fish eggs to foreign countries. Canada received a number of trout eggs in consummation of exchanges previously arranged, while the Argentine Republic, Cuba, and Mexico were likewise on the Bureau's export list. The former was allotted 2,500,000 whitefish eggs. The Republic of Mexico has established a fish-cultural service and rainbow eggs were assigned in order to assist that agency in inaugurating its work. The Bureau again cooperated with the Insular Government of Puerto Rico, furnishing both trout eggs and pondfish.

Throughout the year there are received numerous requests for the allotment of American species to foreign countries. In many instances preliminary inquiry reveals that conditions are unsuited for our more desirable varieties. The number of fish which can be furnished upon such request is also limited. Reports from foreign territories indicate that American game fish have established themselves very successfully in many countries and they are very popular.

Shipments of fish and eggs to foreign countries, fiscal year 1937

Country and species	Eggs	Yearlings and adults
Argentine:		
Whitefish	2,500,000	
Canada:		
Blackspotted trout	900,000	
Brook trout	300,000	
Loch Leven trout	500,230	
Cuba:		
Crappie		665
Mexico:		
Rainbow trout	90,000	
Puerto Rico:		
Catfish		425
Sunfish		1,000
Rainbow trout	100,000	
Total	4,390,230	2,090

TRANSFER OF EGGS BETWEEN STATIONS

While it is a routine administrative procedure to ship eggs between the various stations of the Bureau, a tabulation of such shipments is submitted as an illustration of the interrelationship between the units of an extensive hatchery system. Certain hatcheries are operated principally for the production of the raw material in the form of eggs. These shipments also serve to accelerate the spread of desirable species into new territories. Instance of this may be seen in the fact that the brown trout is becoming increasingly popular in the Eastern States, which has resulted in heavy shipments of the Loch Leven, a closely related form, from the Bozeman, Mont., station.

In this connection it should be pointed out that the shipment of trout eggs to minor auxiliary stations, operated at low overhead cost, is a real economy in comparison with attempting to distribute large-size fish to the same area from a larger hatchery located at a more distant point.

Transfer of eggs between stations, fiscal year 1937

Species	Number of eggs	From—	To—
Black-spotted trout	104,100	Saratoga, Wyo	Springville, Utah.
	107,900	do	Bozeman, Mont.
	200,250	do	Leadville, Colo.
	50,000	Yellowstone Park, Wyo	Baker Lake, Wash.
	1,335,000	do	Bozeman, Mont.
	200,000	do	Clackamas, Oreg.
	200,000	do	Crawford, Nebr.
	375,000	do	Creede, Colo.
	50,000	do	Eagles Nest, N. Mex.
	2,269,300	do	Glacier Park, Mont.
	450,000	do	Hagerman, Idaho.
	5,000	do	Jackson, Wyo.
	3,406,800	do	Ennis, Mont.
	100,000	do	Mt. Rainier, Wash.
	500,000	do	Leadville, Colo.
	250,000	do	Quilcene, Wash.
	350,000	do	Quinault, Wash.
	175,000	do	Spearfish, S. Dak.
	50,000	do	Spokane, Wash.
	100,000	do	Springville, Utah.
Brook trout	200,000	Berkshire, Mass	Nashua, N. H.
	200,000	Craig Brook, Maine	Barneveld, N. Y.
	700,000	do	Cape Vincent, N. Y.
	100,000	do	Duluth, Minn.
	500,000	do	Erwin, Tenn.
	150,000	do	La Crosse, Wis.
	150,000	do	Manchester, Iowa.
	10,500	do	Nashua, N. H.
	200,000	do	Northville, Mich.
	475,000	do	White Sulphur Springs, W. Va.
	250,000	do	Wytheville, Va.
	200,000	Leadville, Colo	Bozeman, Mont.
	150,000	do	Hagerman, Idaho.
	353,000	do	Spokane, Wash.
	804,000	do	Springville, Utah.
	502,000	Creede, Colo	Birdsview, Wash.
	225,000	do	Bozeman, Mont.
	100,000	do	Clackamas, Oreg.
	651,000	do	Crawford, Nebr.
	351,000	do	Duluth, Minn.
	225,000	do	Hagerman, Idaho.
	504,000	do	La Crosse, Wis.
	101,000	do	Lake Mills, Wis.
	200,000	do	Manchester, Iowa.
	200,000	do	Mt. Rainier, Wash.
	400,000	do	Northville, Mich.
	151,000	do	Quilcene, Wash.
	50,000	do	Quinault, Wash.
	130,000	do	Spearfish, S. Dak.
	100,000	do	Spokane, Wash.
	300,000	National Forest of New Hampshire.	Cortland, N. Y.
	250,000	do	Erwin, Tenn.
	200,000	do	Leadville, Colo.
	200,000	do	Nashua, N. H.
	120,000	do	Pittsford, Vt.
	1,745,500	do	St. Johnsbury, Vt.
	100,000	do	Smokemont, N. C.
Grayling	342,200	Yellowstone Park, Wyo	Bozeman, Mont.
	200,000	do	Jackson, Wyo.
	200,000	do	Pittsford, Vt.
Lake Trout	25,000	Cape Vincent, N. Y	Barneveld, N. Y.
	29,000	do	Cortland, N. Y.
Landlocked salmon	5,000	National Forest of New Hampshire.	St. Johnsbury, Vt.
Loch Leven trout	50,200	Bozeman, Mont	Barneveld, N. Y.
	125,000	do	Birdsview, Wash.
	100,400	do	Cape Vincent, N. Y.
	750,100	do	Clackamas, Oreg.
	50,000	do	Cortland, N. Y.
	190,300	do	Crawford, Nebr.
	52,800	do	Creede, Colo.
	100,100	do	Duluth, Minn.
	100,100	do	Flintville; Tenn.
	237,000	do	Hagerman, Idaho.
	251,000	do	La Crosse, Wis.
	75,100	do	Lake Mills, Wis.
	135,700	do	Manchester, Iowa.
	52,250	do	Nashua, N. H.
	100,300	do	Northville, Mich.
	100,100	do	Rochester, N. Y.
	100,400	do	Saratoga, Wyo.
	250,100	do	Spearfish, S. Dak.

Transfer of eggs between stations, fiscal year 1937—Continued

Species	Number of eggs	From—	To—
Loch Leven trout	300,000	do	Springville, Utah.
	6,750,000	Ennis, Mont	Bozeman, Mont.
Rainbow trout	320,000	do	Do.
	196,200	Manchester, Iowa	Do.
	196,500	do	Crawford, Nebr.
	151,200	do	Duluth, Minn.
	312,700	do	La Crosse, Wis.
	76,800	do	Lake Mills, Wis.
	253,300	do	Northville, Mich.
	464,000	Neosho, Mo	Crawford, Nebr.
	220,000	do	Creede, Colo.
	161,000	do	Flintville, Tenn.
	196,800	do	Hagerman, Idaho.
	255,000	do	Saratoga, Wyo.
	152,000	do	Spearfish, S. Dak.
	100,000	Salmon, Idaho	Aquarium, Washington, D. C.
	1,425,000	do	Hagerman, Idaho.
	103,600	Springville, Utah	Birdsview, Wash.
	32,000	do	Bozeman, Mont.
	35,000	do	Crawford, Nebr.
	70,500	do	Quilcene, Wash.
	100,000	do	Quinault, Wash.
	201,300	do	Spokane, Wash.
	150,000	White Sulphur Springs, W. Va	Barneveld, N. Y.
	60,000	do	Cortland, N. Y.
	15,000	Wytheville, Va	Aquarium, Washington, D. C.
	50,000	do	Ogletown, Pa.
	75,000	do	Rochester, N. Y.
	49,000	do	Smokemont, N. C.
Sockeye salmon	850,000	Birdsview, Wash	Quilcene, Wash.
Steelhead trout	250,000	do	Quinault, Wash.
	75,000	do	Mt. Rainier, Wash.
	50,000	do	Salmon, Idaho.

STATION OUTPUT

The list of producing units represents some change from the previous year. The 1937 production was obtained from a total of 90 stations and substations in comparison with 81 reported last year. The former comprise 41 main stations and 49 substations. There was no actual decrease in the number of main stations, but for administrative purposes the establishments at Fairport, Iowa, and Quilcene, Wash., were transferred from the category of main stations to that of substations.

The net increase is accounted for by the opening of several new establishments including those at Santa Rosa, N. Mex., Uvalde, Tex., Hoffman, N. C., Norris, Tenn., and Smokemont, N. C. Several of the field auxiliaries which have been in operation previously were listed individually as to output during the past year, and certain field activities which had been closed down were resumed. Among these was the resumption of striped bass propagation at Weldon, N. C. One auxiliary station, Lakeland Ponds, located in Maryland just outside of Washington, was discontinued.

No tabulation has been included covering the numerous rearing pools in the National Forest areas or under the auspices of sportsmen's organizations. These have received the output of many of the regular hatcheries but as a rule are not operated directly by the Bureau and are therefore not considered as units in the Federal hatchery system. In administering these hatcheries effort has been made to establish a regional set-up whereby the superintendent in charge of a group of stations will not only direct the hatchery activities, but will be available for consultation with State authorities and for preliminary survey of streams and lakes for determination of stocking programs.

In view of the possible criticism which might arise upon noting the distribution of carp, it is necessary to point out that these eggs or fish are planted only where they are already exceedingly abundant and are the basis of commercial fishery. None are distributed outside of such territories.

Stations and substations operated and the output of each, fiscal year 1937

Stations, substations, and species	Eggs	Fry	Fingerlings	Total
Baird, Calif.:				
Battle Creek, Calif.: Chinook salmon			2,943,050	2,953,050
Mill Creek, Calif.: Chinook salmon			1,575,300	1,575,300
Birdsview, Wash.:				
Blackspotted trout			66,000	66,000
Brook trout			46,135	46,135
Chinook salmon			518,360	518,360
Loch Leven trout			80.000	80,000
Rainbow trout			84,810	84,810
Silver salmon		612,000	382,000	994,000
Sockeye salmon	1,250,000	2,000,000	540,000	3,790,000
Steel head trout	125,000		184,000	309,000
Baker Lake, Wash.:				
Blackspotted trout			46,250	46,250
Rainbow trout			23,600	23,600
Mt. Rainier, Wash.:				
Blackspotted trout			136,000	136,000
Brook trout			241,800	241,800
Golden trout			12,000	12,000
Loch Leven trout			22,300	22,300
Rainbow trout			64,100	64,100
Spokane, Wash.:				
Blackspotted trout			57,750	57,750
Brook trout			78,000	78,000
Rainbow trout			372,000	372,000
Boothbay Harbor, Maine:				
Cod	878,855,000			878,855,000
Flatfish		731,700,000		731,700,000
Haddock	47,160,000			47,160,000
Lobster		2,625,000		2,625,000
Pollock	14,532,000			14,532,000
Bozeman, Mont.:				
Blackspotted trout			972,180	972,180
Brook trout			296,218	296,218
Grayling		217,000	72,000	289,000
Loch Leven trout	4,220,600			4,220,600
Rainbow trout			819,990	819,990
Ennis, Mont.:				
Blackspotted trout			148,717	148,717
Grayling		430,840	1,970	432,810
Loch Leven trout		1,186,360	1,358,770	2,545,130
Rainbow trout	100,170		520,517	620,687
Miles City, Mont.:				
Black bass, largemouth			213,088	213,088
Catfish			4,776	4,776
Crappie			70,414	70,414
Sunfish			3,540	3,540
Cape Vincent, N. Y.:				
Black bass, smallmouth		6,000	25,200	31,200
Brook trout			24,500	24,500
Lake herring		160,000		160,000
Lake trout		290,000		290,000
Landlocked salmon			2,500	2,500
Whitefish		160,000		160,000
Yellow perch		2,500,000		2,500,000
Barneveld, N. Y.:				
Brook trout			36,300	36,300
Rainbow trout			10,585	10,585
Cortland, N. Y.:				
Brook trout			335,635	335,635
Lake trout			17,210	17,210
Loch Leven trout			18,910	18,910
Rainbow trout			33,900	33,900
Lakeland, Vt.:				
Pike perch	6,400,000			6,400,000
Yellow perch	14,250,000			14,250,000
Watertown, N. Y.:				
Brook trout		60,000	101,815	161,815
Loch Leven trout			11,245	11,245
Rainbow trout			4,095	4,095

Stations and substations operated and the output of each, fiscal year 1937—Continued

Stations, substations, and species	Eggs	Fry	Fingerlings	Total
Rochester, N. Y.:				
Black bass, largemouth			16,600	16,000
smallmouth			10,000	10,000
Brook trout			15,375	15,375
Loch Leven trout			66,000	66,000
Rainbow trout			101,975	101,975
Clackamas, Oreg.:				
Blackspotted trout			98,350	98,350
Brook trout	125,000		648,000	773,000
Chinook salmon	2,200,000		3,262,500	5,462,500
Loch Leven trout	750,100		152,800	902,900
Rainbow trout			135,650	135,650
Silver salmon			13,270	13,270
Butte Falls, Oreg.:				
Chinook salmon			4,893,500	4,893,500
Rainbow trout			6,590	6,590
Silver salmon			1,003,000	1,003,000
Steelhead trout			922,000	922,000
Big White Salmon, Wash.: Chinook salmon	7,200,000		8,051,200	15,251,200
Little White Salmon, Wash.:				
Chinook salmon	13,025,000		8,713,000	21,738,000
Sockeye salmon			80,750	80,750
Craig Brook, Maine:				
Atlantic salmon			10,000	10,000
Brook trout			835,830	835,830
Landlocked salmon			37,000	37,000
Crawford, Nebr.:				
Black bass, largemouth			50,425	50,425
Blackspotted trout			180,500	180,500
Brook trout		8,000	375,400	383,400
Catfish			640,190	640,190
Crappie			11,185	11,185
Loch Leven trout			276,340	276,340
Rainbow trout			455,040	455,040
Rock bass			6,300	6,300
Sunfish			39,290	39,290
Yellow perch			900	900
Dexter, N. Mex.:				
Black bass, largemouth			573,750	573,750
Catfish			14,800	14,800
Crappie			100	100
Sunfish			338,100	338,100
Santa Rosa, N. Mex.:				
Black bass, largemouth			31,500	31,500
Catfish			14,000	14,000
Crappie			4,300	4,300
Duluth, Minn.:				
Brook trout			625,000	625,000
Lake trout		157,000	21,000	178,000
Loch Leven trout			76,000	76,000
Pike-perch		9,470,000		9,470,000
Rainbow trout			41,000	41,000
Whitefish		2,595,000		2,595,000
Edenton, N. C.:				
Black bass		75,000	20,038	95,038
Crappie			940	940
Glut herring		12,500,000		12,500,000
Shad		6,240,000		6,240,000
Sunfish			27,620	27,620
Warmouth bass			3,100	3,100
White perch		2,500,000		2,500,000
Yellow perch			87	87
Weldon, N. C.: Striped bass		641,000		641,000
Erwin, Tenn.:				
Black bass		503,000	2,416	505,416
Brook trout			418,945	418,945
Rainbow trout			370,580	370,580
Rock bass			3,930	3,930
Sunfish			21,260	21,260
Flintville, Tenn.:				
Black bass			750	750
Loch Leven trout			43,000	43,000
Rainbow trout			138,970	138,970
Rock bass			900	900
Sunfish			1,300	1,300
Fort Belvoir, Va.:				
Black bass			5,670	5,670
Catfish			200	200
Crappie			400	400
Shad		11,758,000		11,758,000
Sunfish			800	800
Yellow perch		237,763,500	1,100	237,764,600

Stations and substations operated and the output of each, fiscal year 1937—Continued

Stations, substations, and species	Eggs	Fry	Fingerlings	Total
Gloucester, Mass.:				
Cod	1,791,862,750	162,832,900		1,954,695,650
Flatfish	12,473,900	43,529,600		56,003,500
Haddock	703,695,600			703,695,600
Lobster		226,500		226,500
Pollock	946,881,520	521,409,650		1,518,291,170
Hagerman, Idaho:				
Blackspotted trout			213,300	213,300
Brook trout			87,130	87,130
Rainbow trout	200,000		541,700	741,700
Salmon, Idaho:				
Blackspotted trout			54,000	54,000
Loch Leven trout	122,000		61,400	183,400
Rainbow trout			730,000	730,000
Hartsville, Mass.:				
Black bass, smallmouth		590,000		590,000
Catfish			3,175	3,175
Brook trout			147,850	147,850
La Crosse, Wis.:				
Black bass, largemouth			29,615	29,615
Brook trout			618,300	618,300
Buffalo fish			19,900	19,900
Carp			275,900	275,900
Catfish			694,960	694,960
Crappie			614,837	614,837
Loch Leven trout			205,600	205,600
Pike-pickerel			39,700	39,700
Rainbow trout			213,700	213,700
Sunfish			467,315	467,315
White bass			24,800	24,800
Yellow perch			20,150	20,150
Miscellaneous fishes			127,000	127,000
Bellevue, Iowa:				
Black bass, largemouth			30,570	30,570
Buffalo fish	283,500,000		1,645,500	245,145,500
Carp	64,000,000		418,300	64,418,300
Catfish			2,350,000	2,350,000
Crappie			675,800	675,800
Pike-pickerel			7,230	7,230
Sunfish			2,714,000	2,714,000
White bass			8,950	8,950
Miscellaneous fishes			1,227,785	1,227,785
Fairport, Iowa:				
Black bass, largemouth		249,000	53,950	302,950
smallmouth			3,600	3,600
Buffalo fish	33,750,000		79,200	33,829,200
Carp	69,500,000		125,800	69,625,800
Catfish			128,400	128,400
Crappie			19,115	19,115
Pike-pickerel			50	50
Sunfish			160,285	160,285
White bass			925	925
Yellow perch			5,375	3,375
Miscellaneous fishes			21,655	21,655
Guttenberg, Iowa:				
Buffalo fish	12,000,000			12,000,000
Carp	30,000,000			30,000,000
Homer, Minn.:				
Black bass, largemouth			77,100	77,100
Buffalo fish			3,375	3,375
Carp			15,775	15,775
Catfish			424,680	424,680
Crappie			2,653,425	2,653,425
Drum			1,000	1,000
Pike-pickerel			9,375	9,375
Sunfish			1,051,700	1,051,700
White bass			34,325	34,325
Yellow perch			14,750	14,750
Miscellaneous fishes			132,000	132,000
Lake Mills, Wis.:				
Black bass, largemouth		6,000	44,290	50,290
Brook trout			82,500	82,500
Crappie			20,800	20,800
Loch Leven trout			62,700	62,700
Rainbow trout			61,000	61,000
Yellow perch			500	500
Lynxville, Wis.:				
Black bass, largemouth			141,475	141,475
Buffalo fish			586,500	586,500
Carp			447,500	447,500
Catfish			1,965,000	1,965,000
Crappie			772,850	772,850
Pike-pickerel			17,050	17,050
Sunfish			1,982,090	1,982,090
Yellow perch			2,800	2,800

Stations and substations operated and the output of each, fiscal year 1937—Continued

Stations, substations, and species	Eggs	Fry	Fingerlings	Total
La Crosse, Wis.—Continued.				
Marquette, Iowa:				
Black bass, largemouth			232,682	232,682
Buffalo fish			1,326,300	1,326,300
Carp			1,505,300	1,505,300
Catfish			15,324,850	15,324,850
Crappie			5,004,600	5,005,600
Drum			43,800	43,800
Pike-pickerel			49,550	49,550
Sunfish			16,921,450	16,921,450
White bass			26,650	26,650
Yellow perch			69,930	69,930
Miscellaneous fishes			133,500	133,500
Rochester, Ind.:				
Black bass, largemouth			288,025	288,025
smallmouth			24,270	24,270
Catfish			1,120	1,120
Crappie			7,180	7,180
Rock bass			5,200	5,200
Sunfish			88,020	88,020
Yellow perch			5,000	5,000
Upper Mississippi River ponds:				
Black bass, largemouth			770,850	770,850
smallmouth			3,105	3,105
Buffalo fish			10,100	10,100
Carp			125,900	125,900
Crappie			5,985	5,985
Drum			200	200
Pike-pickerel			10,400	10,400
Sunfish			16,195	16,195
White bass			7,000	7,000
Miscellaneous fishes			68,000	68,000
Lake Park, Ga.:				
Black bass, largemouth			50,495	50,495
Catfish			110,930	110,930
Sunfish			176,440	176,440
Warm Springs, Ga.:				
Black bass, largemouth		247,500	91,680	339,180
Catfish			274	274
Sunfish			398,800	398,800
Lamar, Pa.:				
Brook trout			92,200	92,220
Loch Leven trout			22,554	22,554
Rainbow trout			81,165	81,165
Ogletown, Pa.:				
Brook trout			175,280	175,280
Loch Leven trout			16,900	16,900
Leadville, Colo.:				
Blackspotted trout			267,000	267,000
Brook trout	1,516,000		1,991,600	3,507,600
Lake trout			46,780	46,780
Loch Leven trout			49,000	49,000
Rainbow trout			510,600	510,600
Creede, Colo.:				
Blackspotted trout	300,000		248,000	548,000
Brook trout	141,000		1,922,900	2,063,900
Loch Leven trout			74,500	74,500
Rainbow trout			570,050	570,050
Eagles Nest, N. Mex.:				
Blackspotted trout			49,000	49,000
Rainbow trout			436,000	436,000
Leetown, W. Va.:				
Black bass, largemouth		3,000	9,990	12,990
smallmouth			32,130	32,130
Brook trout			23,506	23,506
Crappie			625	625
Loch Leven trout			8,983	8,983
Rainbow trout			103,512	103,512
Silver salmon			20,110	20,110
Louisville, Ky.:				
Black bass, largemouth			15,330	15,330
smallmouth		40,000	11,785	51,785
Crappie			280	280
Rock bass			7,350	7,350
Sunfish			49,800	49,800
Mammoth Springs, Ark.:				
Black bass, largemouth		100,000	178,825	278,825
smallmouth			55,500	55,500
Rock bass			80,000	80,000
Sunfish			102,900	102,900
Manchester, Iowa:				
Black bass, smallmouth			1,900	1,900
Brook trout			149,040	149,040

Stations and substations operated and the output of each, fiscal year 1937—Continued

Stations, substations, and species	Eggs	Fry	Fingerlings	Total
Manchester, Iowa—Continued.				
Loch Leven trout	40,000		68,300	108,300
Rainbow trout	89,900	10,000	118,100	218,000
Rock bass			19,600	19,600
Marion, Ala.:				
Black bass, largemouth			303,070	303,070
Sunfish			2,162,090	2,162,090
Tupelo, Miss.:				
Black bass, largemouth		15,000	314,815	329,815
Sunfish			245,575	245,575
Nashua, N. H.:				
Black bass, smallmouth		12,000	450	12,450
Brook trout			55,500	55,500
Catfish			1,900	1,900
Rainbow trout			1,100	1,100
National Forest of N. H. (Berlin, N. H.):				
Brook trout	1,300,000	888,825	290,940	2,479,765
Lake trout		113,100		113,100
Rainbow trout		148,400		148,400
St. Johnsbury, Vt.:				
Black bass, smallmouth			2,300	2,300
Brook trout		1,387,500		1,387,500
Lake trout		38,985		38,985
Landlocked salmon			20,000	20,000
Neosho, Mo.:				
Black bass, largemouth		219,000	35,725	254,725
Catfish			11,010	11,010
Crappie			27,550	27,550
Rainbow trout	96,500		63,635	160,135
Rock bass			11,930	11,930
Sunfish			38,965	38,965
Bourbon, Mo.: Rainbow trout	1,147,000			1,147,000
Natchitoches, La.:				
Black bass, largemouth			436,747	436,747
Crappie			1,510	1,510
Sunfish			54,960	54,960
Warmouth bass			5,665	5,665
Tishomingo, Okla.:				
Black bass, largemouth			347,000	347,000
Catfish			7,350	7,350
Crappie			112,390	112,390
Sunfish			212,020	212,020
Warmouth bass			5,000	5,000
Northville, Mich.:				
Black bass, largemouth			9,975	9,975
smallmouth			68,430	68,430
Brook trout			647,215	647,215
Loch Leven trout			95,000	95,000
Rainbow trout			207,490	207,490
Rock bass			1,600	1,600
Sunfish			2,210	2,210
Orangeburg, S. C.:				
Black bass, largemouth			466,540	466,540
Catfish			4,375	4,375
Crappie			9,905	9,905
Sunfish			234,245	234,245
Warmouth bass			9,290	9,290
Yellow perch			195	195
Jacksonboro, S. C.: Shad		65,000		65,000
Hoffman, N. C.:				
Black bass, largemouth		53,000	5,000	58,000
Sunfish			143,000	143,000
Pittsford, Vt.:				
Brook trout			51,200	51,200
Rainbow trout			37,115	37,115
Put-in-Bay, Ohio:				
Pike perch		212,175,000		212,175,000
Whitefish	2,280,000	83,500,000		85,780,000
Quinault, Wash.:				
Blackspotted trout			181,560	181,560
Brook trout			92,000	92,000
Sockeye salmon			1,939,750	1,939,750
Steelhead salmon			80,950	80,950
Duckabush, Wash.: Chum salmon		10,990,000		10,990,000
Quilcene, Wash.:				
Blackspotted trout			228,000	228,000
Brook trout			217,000	217,000
Chum salmon		6,415,500		6,415,500
Rainbow trout			154,260	154,260
Silver salmon			27,215	27,215
Sockeye salmon			250,000	250,000
Steelhead trout			259,115	259,115

Stations and substations operated and the output of each, fiscal year 1937—Continued

Stations, substations, and species	Eggs	Fry	Fingerlings	Total
Saratoga, Wyo.:				
Blackspotted trout			351,790	351,790
Brook trout			798,330	798,330
Loch Leven trout			297,465	297,465
Rainbow trout			236,520	236,520
Spearfish, S. Dak.:				
Blackspotted trout			124,450	124,450
Brook trout			599,835	599,835
Grayling			5,500	5,500
Loch Leven trout			135,560	135,560
Rainbow trout			150,160	150,160
Springville, Utah:				
Blackspotted trout			310,000	310,000
Brook trout	302,000		701,680	1,003,680
Bear Lake, Utah:				
Brook trout			204,880	204,880
Lake trout			79,600	79,600
Rainbow trout			30,400	30,400
Sockeye salmon (landlocked)			112,355	112,355
Uvalde, Tex.:				
Fort Worth, Tex.:				
Black bass, largemouth			46,700	46,700
Catfish			2,305	2,305
Crappie			36,715	36,715
Sunfish			26,330	26,330
San Marcos, Tex.:				
Black bass, largemouth		217,000	139,135	356,135
Crappie			1,890	1,890
Sunfish			154,520	154,520
White Sulphur Springs, W. Va.:				
Brook trout			960,060	960,060
Loch Leven trout			28,000	28,000
Rainbow trout	631,000		626,930	1,257,930
Rock bass			6,000	6,000
Sunfish			51,800	51,800
Woods Hole, Mass.:				
Flatfish		690,879,000		690,879,000
Mackerel		8,833,000		8,833,000
Wytheville, Va.:				
Black bass, largemouth			21,065	21,065
smallmouth		12,000	5,500	17,500
Brook trout			381,350	381,350
Rainbow trout	1,565,000		276,020	1,841,020
Rock bass			19,900	19,900
Sunfish			93,625	93,625
Harrison Lake, Va.:				
Black bass, largemouth			39,875	39,875
Crappie			6,450	6,450
Shad		350,000		350,000
Sunfish			23,350	23,350
Norris, Tenn.: Black bass, largemouth		404,500	3,000	407,500
Smokemont, N. C.: Rainbow trout			53,865	53,065
Yellowstone Park, Wyo.:				
Blackspotted trout	10,137,100		6,810,000	16,947,100
Grayling	1,543,000	625,000		2,168,000
Jackson, Wyo.:				
Blackspotted trout			90,500	90,500
Grayling		197,200		197,200
Lake trout			90,000	90,000

EGG COLLECTIONS

Egg collections during the fiscal year 1937 totaled 8,532,198,900 in comparison with 8,683,260,300 for 1936. As usual, the greater proportion of these collections comprised four marine species, the eggs of which are fertilized and planted directly on the spawning grounds. Weather conditions, which greatly affect the collection of eggs from wild fish, were generally more favorable during 1936. The drop in collections from certain species of Pacific salmon was due, in part, to the regularly recurrent "off year" of these forms.

Comparison of egg collections, fiscal years 1936 and 1937

Species	1936	1937	Species	1936	1937
Shad	22, 128, 000	20, 034, 000	Yellow perch	324, 166, 000	256, 014, 000
Whitefish	59, 970, 000	138, 175, 000	Cod	3, 956, 886, 000	2, 864, 601, 000
Chinook salmon	75, 282, 000	52, 466, 400	Haddock	430, 109, 000	770, 148, 000
Chum salmon	19, 703, 000	22, 383, 000	Pollock	1, 462, 985, 000	1, 667, 138, 000
Silver salmon	4, 487, 000	2, 193, 000	Flatfish (flounder)	1, 634, 507, 000	1, 639, 143, 000
Sockeye salmon	16, 262, 000	7, 653, 000	Mackerel	1, 796, 000	12, 300, 000
Steelhead salmon	2, 547, 000	2, 377, 400	Lake herring	6, 760, 000	1, 600, 000
Rainbow trout	24, 154, 000	22, 381, 000	Glut herring		24, 220, 000
Blackspotted trout	40, 879, 000	35, 131, 100	Striped bass		1, 260, 000
Loch Leven trout	15, 757, 000	11, 563, 000	Carp	1, 500, 000	163, 500, 000
Lake trout	1, 578, 500	918, 000	Buffalo fish	13, 912, 000	329, 250, 000
Brook trout	27, 128, 800	32, 585, 000			
Grayling	3, 918, 000	3, 715, 000	Total	8, 683, 260, 300	8, 532, 198, 900
Pike perch	536, 845, 000	451, 450, 000			

NOTES ON OPERATIONS

COMMERCIAL SPECIES

Pacific salmon.—The collection of approximately 5,000,000 chinook salmon eggs at the Battle Creek and Mill Creek, Calif., substations was somewhat below the normal take in this territory. At the former point a concrete settling tank for the water supply was constructed. At the latter location a new concrete structure was installed as a foundation for installing the racks used in trapping the fish. The station garage was enlarged and remodeled to provide office and shop space.

The Baird, Calif., station was largely inactive and, at the end of the year, arrangements were being made for its abandonment and release to the Reclamation Service. A large dam contemplated in this area would effectively prevent the continuation of fish-cultural operations at this point. This marks the close of an establishment which was one of the earliest hatcheries operated in the United States.

In the Columbia River territory, the Clackamas, Oreg., station and its auxiliaries collected a total of 49,146,000 eggs, some 15,000,000 less than in 1936. Excellent collections were achieved with the chinook salmon at both the Big White Salmon and Little White Salmon stations. Flood conditions restricted the collection of steelhead trout eggs at the Butte Falls substation. Over 1,000,000 trout eggs were incubated at the Clackamas station, the fingerlings being released in various local waters. The surplus of chinook salmon eggs at Little White Salmon substation necessitated planting some 6,000,000 eyed eggs directly in local streams. Flooding of the station site by the pool from the Bonneville Dam will materially affect future operations here. Consequently, a deficiency appropriation of $60,000 was made available to provide for the relocation of the station and transfer of the major portion of the work. A site at Tyee Springs on the Wind River near Carson, Wash., in the Columbia National Forest was selected. Construction activities were commenced in June. At Big White Salmon substation the run of chinook salmon was sufficient to have permitted the collection of additional eggs had trough space been available. As it was, several million eyed eggs were planted directly in suitable streams.

In the Puget Sound territory, the Birdsview, Wash., station almost doubled the output of the previous year, handling 4 species of salmon and 3 varieties of trout. An excellent run of sockeye salmon has been

built up by plants made from this station over a number of years. Interesting data on the migrating characteristics of the species were also obtained. A Works Progress Administration project resulted in some clearing and grading of the grounds and repairs to buildings. There was also an extensive distribution of trout fingerlings from this station. Good results were obtained by incubating some of the eggs on floating trays.

At the Baker Lake, Wash., substation trout fingerlings on hand were released in the fall. During the winter heavy snow caused the collapse of several of the buildings and damage to others. C. C. C. aid was obtained for salvaging the material and remodeling the sawmill into a hatchery. This work was under way at the close of the year.

Over 650,000 trout eggs were shipped in to the Mt. Rainier, Wash., substation and the resulting fish were released in various waters of Mt. Rainier National Park. Further investigation was made of the possibility of collecting eggs from wild fish in the park. Work was started on construction of two new rearing ponds. The rearing project located at Spokane, Wash., produced 500,000 fingerlings which were released to the States of Washington and Idaho. W. P. A. aid was secured in remodeling a general service building.

Under a revision of policy at the Quinault, Wash., hatchery, collections of sockeye salmon eggs were restricted to 2,000,000, the remainder of the run being allowed to spawn naturally. Space and funds made available by this procedure are being utilized for more intensive propagation of trout. However, all salmon are reared to fingerling size before release. The several hundred thousand trout fingerlings produced were distributed in the waters of the Olympic Peninsula, which has become increasingly popular as a recreational center.

The Duckabush and Quilcene, Wash., substations made capacity collections of over 19,000,000 chum salmon eggs. At the latter point more attention has been given to the propagation of trout, and numerous fingerlings were distributed in local waters. One of the buildings formerly used as an office was remodeled into a small dwelling. The fish-food dehydrating plant was operated successfully and the dry salmon meal produced was utilized by a number of the trout hatcheries in the Western territory. Production has so far been insufficient to meet the requirements.

MARINE SPECIES

The continued propagation of winter flounder at the Woods Hole, Mass., station has produced interesting results. There have been rather definite indications that plants of these fry in Long Island Sound and Narragansett Bay are responsible for an increase in young flounders. Almost 700 million fry were produced at the hatchery, in addition to some 8 million mackerel fry.

In contrast, the Gloucester, Mass., station concentrated more strongly on the so-called "off-shore" work where spawntakers are assigned to fishing vessels for fertilizing and planting the eggs of haddock, pollock, and cod. The two former species were handled in greatly increased numbers, whereas there was a recession in the production of cod and flatfish. The hatchery was, of course, operated to capacity when sufficient eggs were obtainable. The total number of eggs handled by the station exceeded 4,400,000,000. The station

extended its lobster-cultural work, collecting 1,200,000 eggs, which left some 1,000,000 fry on hand at the close of the year.

While the Boothbay Harbor, Maine, station reported favorable weather conditions, a shortage of flounders on the regular spawning grounds curtailed production of this species to slightly more than 730 million fry. An unusual development of slime on the spawning grounds is considered to have some bearing on the absence of breeding fish. Special effort in the spring yielded collections of cod eggs numbering slightly less than in the previous year. A moderate number of haddock and pollock eggs was also obtained. Here, too, in cooperation with the State of Maine, lobster culture was resumed. Three and one-fourth million fry were hatched. A new method of rearing with artificial feeding, as developed in Connecticut, was tried out on a portion of the fry, the balance being liberated.

GREAT LAKES SPECIES

The propagation of commercial species of the Great Lakes has continued at a relatively low level except on Lake Erie. Here the Federal hatchery at Put-in-Bay has been operated on a joint basis with the State of Ohio. One hundred and thirty-four million whitefish eggs and 451 million pike-perch eggs were handled in this work, with the hatch averaging at normal proportions.

Since there is no special open season for egg-taking operations in Michigan waters, the Duluth, Minn., station secured only a few hundred thousand lake trout eggs, and 3¼ million whitefish eggs. Ten million pike-perch eggs were allotted by the State of Minnesota.

The Cape Vincent, N. Y., station was unable to send spawntakers into the field due to shortage of funds, but secured whitefish, lake trout and lake herring eggs from local fishermen. The total secured by this means approximated 2¾ millions. Some yellow perch and pike-perch fry were obtained from operations at the Swanton, Vt., substation which was maintained by the State of Vermont.

As the work with commercial species at these stations has been curtailed, the slack has been taken up by extending the propagation of game fish. At Cape Vincent in particular the propagation of smallmouth bass has been quite successful and a number of trout rearing substations are operated in this field.

ANADROMOUS SPECIES, ATLANTIC COAST

Propagation of Atlantic salmon has been virtually discontinued because of inability to secure eggs from Canada. No supply is available from domestic sources. The Craig Brook, Maine, station distributed a few fingerlings, which had been held over from the previous year.

The 11¾ million shad fry produced at the Fort Belvoir, Va., station represent a moderate increase over the previous year. This station also supplemented its work with shad by hatching yellow perch, of which 237 million fry were produced.

At the Edenton, N. C., station vigorous efforts were made to extend the shad propagation activities. In cooperation with the State an employee of the Bureau was assigned to make a study of all factors concerned with the conservation of this species. A small run of shad defeated efforts to bring in eggs from distant points but collections from the vicinity of the station yielded 7¼ million eggs, an increase

over the previous year. Promising experiments were conducted, looking toward the rearing of shad and striped bass in ponds. Favorable results were also achieved in the hatching of white perch and herring. Again, in cooperation with the State of North Carolina, the Edenton personnel assisted in hatching striped bass at the Weldon substation. A new hatchery and water supply system was installed. Egg collections were rather limited, due to restrictions on fishing and the new equipment caused some loss of fry until corrections were made.

Supplementing its hatching activities on the Edisto River, the Orangeburg, S. C., station developed a new shad unit on the Black River. However, unfavorable water conditions and other adverse factors reduced total egg collections to about 650,000, and the fry production was very poor. In the aggregate the shad hatchery production for the entire Atlantic Seaboard surpassed the records of the past several years.

GAME-FISH PROPAGATION

Upon noting that only about 126 million of the total hatchery production of 1937 consisted of strictly game or pan species, the angler may be inclined to feel that this phase of the work has been neglected. As a matter of fact, however, the funds, facilities and personnel assigned to the propagation of sport fishes were fully as large as were the assignments for the propagation of food and commercial varieties. Game fish are "hand raised" and many are planted at the legal size. Transporting them to the myriads of lakes and streams which are to be stocked is also an expensive procedure. The aggregate production of game trout was somewhat lower than in the previous year, but an increase was recorded for bass.

Much of the aquicultural research is directed toward perfecting the artificial propagation of the game fishes and this has resulted in the adoption of many improved practices. Selective breeding, food research, and disease studies have all contributed to the maintenance of angling as one of our most important outdoor recreations. Supplementing this is the fact that virtually all of the new hatchery construction has been for the purpose of building up the stock of sport fishes. With the States and the Federal Government setting aside and improving tremendous areas suitable for stocking, the need for augmented production of trout, bass, and panfish has never been greater.

ROCKY MOUNTAIN TERRITORY

The tremendous amount of Federally owned land in the Rocky Mountain States constitutes a pressing need for increased production of trout. Emphasis is placed upon fishing as one of the recreational assets of this territory, and while the Bureau's output is distributed to various public waters, the National Forests alone could well utilize the entire production.

Considering the activities of the individual stations, in Utah the Springville hatchery suffered a slight reduction in the collection of rainbow trout eggs from station brood stock. By shipments from other stations the production of fingerlings was kept up to satisfactory levels. One small pond was utilized for the production of bass for which there is a limited demand in that section. The depredations of birds greatly curtailed the output.

At the Bear Lake, Utah, substation, W. P. A. labor was secured for effecting certain improvements to buildings, roads, ponds, etc. No eggs were taken from station brood stock but trout and salmon of four species were shipped in.

At the Spearfish, S. Dak., station W. P. A. work was under way throughout the greater part of the year. Accomplishments included the construction of a stone hatchery building, a flume for water-supply requirements, construction of a stone garage, installation of a refrigerator, and various minor improvements. This station experienced serious difficulty due to failure of the spring-water supply ordinarily utilized. By the means mentioned above, additional water was obtained and the difficulties in this connection were temporarily overcome. The distribution of the fingerling output was handled on a cooperative basis, with the assistance of the United States Forest Service, local sportsmen's organizations, and the State Game and Fish Commission.

The Saratoga, Wyo., station conducted its activities along routine lines and obtained normal success in the production and distribution of trout fingerlings. A special distribution tank was constructed during the year for handling trout in truck shipments. Some C. C. C. labor was utilized in caring for the grounds.

In the Colorado territory, a W. P. A. project was developed, resulting in the construction of two circular rearing pools at the Leadville station, the remodelling and repainting of several buildings, and improvements to a water supply ditch and dam. As usual, the Leadville station cooperated with local parties in the collection of trout eggs and obtained 5¾ million brook trout eggs, and approximately 300,000 Loch Leven eggs through this means.

At the Creede, Colo., substation the year's work was more successful than at any time since its establishment. Close to 3 million trout fingerlings were distributed, in addition to shipments of over 3 million trout eggs to other establishments. The field egg-collecting station at Lake San Cristobal was operated successfully, yielding 4¼ million brook and rainbow eggs. This increase was achieved, despite the fact that the lake is fished heavily. An additional dwelling was completed and made ready for occupancy and at the close of the year arrangements were being made for the installation of Diesel-electric power.

In the Idaho territory, the Hagerman station was likewise the beneficiary of a W. P. A. project, which permitted the construction of a storage shed, oil house, renewal of a pipe line, and repairs to ponds. The fish-cultural work, both the production of rainbow eggs from station brood stock and the rearing of fingerlings for distribution, was of normal scope and average success.

The substation at Salmon, Idaho, was utilized for handling eggs collected from Williams Lake and other local waters. This station is operated on a joint basis with the Idaho Department of Fish and Game and the collections of rainbow trout eggs amounted to 4,600,000. The station was closed after distribution of the fingerlings, since it is more economical to operate it on a seasonal basis.

In the Montana territory, the Bozeman station constructed a new addition to the hatchery building and made considerable improvements to the other buildings. Work was started on the construction of two rearing ponds. The Bozeman station, as usual, was utilized as a center for shipping the Loch Leven eggs collected at the substation

in the Madison Valley. The substation at Ennis is still uncompleted and lacks adequate rearing space and other facilities. Due to demands for hydro-electric purposes of the water stored in Meadow Lake, the collection of Loch Leven trout eggs from wild fish was greatly reduced in comparison with collections of previous years.

At the Ennis, Mont., substation 1,000 feet of new water-supply line was laid. A brood stock is being built up here to offset, in part, the drop in the collections of rainbow and Loch Leven eggs from the Madison River.

The output of bass from the Miles City, Mont., substation exceeded all previous records at this point, although there was a drop in the production of other species. A heavy loss of bass brood stock was experienced due to smothering under heavy ice in the wintering pond. W. P. A. labor was utilized in making general improvements.

The pondfish station at Dexter, N. Mex., reported the largest production since establishment of the station, with an output approaching 1 million. Fish ducks took a heavy toll of sunfish and crappie brood stock. Here, too, approval of a W. P. A. project permitted development of a number of improvements, including construction of new ponds, holding tanks, and the grading of roads. The new substation at Santa Rosa, N. Mex., was in operation, but little distribution was undertaken prior to the close of the year. Egg collections and propagation of trout and grayling at Yellowstone Park met with the usual success.

The Seattle office personnel maintained close supervision over the foregoing activities and in addition handled details of a cooperative program of fish food studies conducted with the University of Washington.

NEW ENGLAND TROUT STATIONS

The York Pond, N. H., station experienced no trace of the poor quality brook trout eggs which marred the operations of the previous year. Likewise, the mortality of brood stock was strictly within normal limits. Both the States of New Hampshire and Vermont contributed funds for the production of larger fish to be stocked in their respective waters. Extensive developmental work was prosecuted here; utilizing C. C. C. and W. P. A. labor. New ponds were created and the water-supply system improved. An ice house was constructed. Total brook trout egg collections amounted to approximately 9,000,000, of which over 5,000,000 were shipped to other Bureau stations and State conservation departments, etc.

At the Craig Brook, Maine, station three circular ponds were constructed by C. C. C. labor for the purpose of rearing fish for Acadia National Park. The collection of 4,800,000 brook trout eggs was 1,400,000 in excess of the figures for the previous year. Of these, 2,075,000 were shipped to other points. A limited number of Atlantic salmon were carried over at the end of the year. Improvements aside from the new ponds consisted of minor repairs to the older ponds. At the close of the year a much larger number of brook trout were being held over than has been the practice in the past.

At Nashua, N. H., the hatch of over 500,000 trout eggs permitted normal production and distribution.

A continuation of the former practice of collecting smallmouth bass fry from a reservoir lake in Connecticut produced over 500,000 of this species for distribution, one-half of which were allocated to the

State of Connecticut. The work was handled by the Hartsville, Mass., station, which also propagated its normal quota of trout, many of which were of large size.

The St. Johnsbury, Vt., station achieved unusually good results in rearing landlocked salmon fingerlings. W. P. A. assistance permitted the renewing of foundations of the hatchery building, as well as plastering the interior of the building, painting exteriors, and improvements to ponds and grounds. The work at this station was closely coordinated with that at the York Pond, N. H., station.

COMBINATION TROUT AND PONDFISH STATIONS

In view of the overlapping of the range of cold-water and warm-water species, the desirability of propagating both at the same hatchery is self-evident. In practice, combination hatcheries have generally proved to be most efficient with one or the other of these two types. Natural conditions have determined which group could be produced most efficiently. Stations in this category were nevertheless of great importance in maintaining a balanced distribution program in 1937.

The Neosho, Mo., station has been conducting a number of interesting experiments in the development of a more economical and satisfactory food for rainbow trout. Earlier experiments indicated that an excessive proportion of dry foods affected the growth and the egg production. Production of fingerlings for distribution showed a slight improvement over last year but the egg collections were somewhat less. Interesting results were achieved in the artificial feeding of bass fingerlings, utilizing the same food as is employed with rainbow trout. Bream were also reared by the same means. The fish were unusually free from disease.

At the Bourbon, Mo., substation, operated on a cooperative basis, rainbow egg collections were less than for several years past, due to a curtailment in the number of breeders carried.

Aside from a normal production of trout at the Erwin, Tenn., station, a yield of over 500,000 bass was unusually favorable.

The Flintville, Tenn., station continued to experience difficulty in the propagation of pondfish, due to seepage of water in the rearing ponds. The station discontinued the maintenance of brood stock for the collection of rainbow trout eggs, the requirements for this species being taken care of by the shipment of eggs from other sources. A garage building was constructed during the year.

At the Lake Mills, Wis. station, W. P. A. construction has continued throughout the year, resulting in the completion of one large pond and five smaller ponds, together with other general improvements. The production of bass at this point exceeded that for the previous year.

The Lamar, Pa., station is in an incomplete status and is utilized only for the rearing of trout which are transferred in the fry stage from other stations. Over 200,000 fingerlings of three species were distributed. At the close of the year arrangements were being made for development of a C. C. C. construction program, involving erection of a hatchery building and the construction of bass ponds. This labor was also utilized during the year for the construction of eight trout-rearing ponds, landscaping, road building and general improvements.

The output of the Manchester, Iowa, station fell below the level of the previous year but the production of 1,500,000 rainbow trout eggs

was very satisfactory and permitted numerous shipments to other stations. The quality of these eggs was extra good. The propagation of smallmouth bass was virtually a failure. The cold water in the bass ponds may be considered a contributing cause to this result. The Manchester station furnished a considerable number of rainbow trout for such waters as the State of Iowa desired to stock with this species.

The Northville, Mich., station conducted 7 cooperative feeding stations to which trout fingerlings were transferred in the late spring for rearing. This station furnished a considerable number of trout to the States of Ohio and Indiana, enabling those States to stock their limited mileage of trout waters without the necessity of establishing trout-hatching or rearing units of their own. This station also supplied a considerable number of trout and pondfish, particularly smallmouth bass, for Forest Service waters. The total output of fish exceeded 1 million.

The hatchery at Smokemont, N. C., operated solely for the stocking of waters in the Great Smoky National Park, was completed during the year. The hatchery building has a capacity of 30 troughs and is of an architectural design to harmonize with the type of structures approved by the National Park Service. A residence was also constructed, together with additional service stations. This station has been equipped with a small hydroelectric power plant. Approximately 600,000 eggs were hatched. However, mortality in the rainbow fingerlings materially reduced the output. At the close of the year several hundred thousand trout fingerlings were being reared for distribution at legal size.

PONDFISH STATIONS

The hatcheries which contribute most fully to maintenance of angling for the largest number of people are those which propagate the socalled "warm water" pondfishes, of which the bass are the most popular form and the most difficult to propagate in large quantities. The methods followed in culturing these species are really merely modifications of the natural reproductive processes and are in part subject to the same hazards. Consequently, there was considerable fluctuation in the output of the different stations with, however, a trend toward increased distribution, particularly in the case of bass.

The Warm Springs, Ga., station, operating along normal lines, distributed almost 250,000 bass fry in addition to more than 500,000 bass, bream, and catfish fingerlings. The station at Lake Park, Ga., enjoyed a successful season, the distribution being largely handled by the State of Georgia.

The station at Tupelo, Miss., made a few minor improvements, including the installation of new holding troughs. The production of over 28,000 black bass per acre of water, and over 19,000 bream per acre of water is indicative of the successful operation of this establishment which, however, is restricted in its pond area.

In contrast to previous years, very little construction work was carried on at the Marion, Ala., station. The number of bass distributed to applicants was practically the same as last year but the number of fingerlings left in the pond for subsequent distribution was greater. Over 530,000 bass were handled. There was an increase of

over 400 percent in the production of bream, the deliveries to applicants amounting to 2,199,000. Efforts to propagate crappie were largely unsuccessful. The depredations of fish-eating birds have rendered it difficult to maintain an adequate brood stock at this station.

The Orangeburg, S. C., station established an all-time record in the production of pondfishes. This was due partially to the creation of additional pond space at a small auxiliary located at St. Matthews, S. C. The total output of all species from all sources was 727,000 fingerlings, an increase of 173,000 over the previous year. This hatchery directed the activities of an auxiliary at Hoffman, N. C., which was in the process of construction during the major part of the year. However, six ponds were utilized for fish production with a yield of 172,000 fry and fingerlings, largely bream. The Orangeburg station has experimented with the production of the red-breasted sunfish, a highly desirable species, which is limited in its normal distribution.

The new Tennessee Valley Authority hatchery at Norris, Tenn., operated by the Bureau, entered full production for the first time and produced over 400,000 bass fry in four acres of water. Many of these were distributed to rearing ponds within the T. V. A. area.

The Mammoth Springs, Ark., station suffered a recession in its production of smallmouth bass but made up for this reduction by an increased output of largemouth bass. Lack of adequate rearing space necessitated distribution of much of the hatch in the fry stage.

The activities at the Louisville, Ky., station were of necessity seriously affected by the disastrous flood which completely inundated the station grounds. Much of the equipment was badly damaged or completely ruined. Roadways were washed out and practically all brood fish were lost. Those surviving produced only a limited number of fry so that the distribution amounted to only 40,000 smallmouth bass fry and 85,000 fingerlings. Strenuous efforts were made to secure additional brood stock during the spring months with the aid of the State Fish and Game Department. This met with comparatively little success, however, and this station contributed little toward the aggregate output of the Bureau's hatcheries. Rehabilitation work was undertaken with the assistance of the Works Progress Administration and the National Youth Administraton. At the close of the year much of the damage to buildings, grounds, ponds, etc., had been repaired.

The Harrison Lake, Va., station has not yet reached the level of production which should be maintained when conditions in the new ponds have become more stable.

In the Texas field the Uvalde station was not completed sufficiently early to secure a worthwhile output of fish. Elsewhere in this territory production approximated normal figures.

In summary, it may be said that the pondfish hatcheries offer the greatest opportunity and need for improvement as to methods and extension of facilities, and this situation was given the fullest consideration in planning the program for the fiscal year 1938.

MISSISSIPPI RIVER TERRITORY

As in the past, semicontrolled rearing ponds were operated at three points in the Upper Mississippi Wildlife and Fish Refuge. Two

ponds were under construction at the close of the year in a program for enlarging this activity. The output of fish from this source was quite successful and affords confirmation of the belief that such ponds must be depended upon to keep up production when the rescue work is terminated, due to canalization. The rescue activities are the subject of discussion elsewhere in this report.

Trout culture was carried on at the La Crosse, Wis., station with very good results, part of the output being utilized at two Forest Service rearing stations in Wisconsin. Cooperative trout ponds, supervised by this station and stocked with trout hatched at La Crosse, numbered 55 in Wisconsin and 10 in Minnesota. The State of Wisconsin adopted the program to a considerable extent in connection with its own activities. Additional services rendered by the personnel of this station included survey and inspection activities for the Forest Service and several of the States. Many of the fish supplied to the aquarium at Washington were obtained through the La Crosse headquarters.

Among the stations operating in this general territory under supervision from La Crosse were those at Fairport, Iowa, Lake Mills, Wis., and Rochester, Ind., as well as the seasonal rescue stations at various points in the Upper Mississippi Refuge. The Fairport station reported one of the best hatches of largemouth bass that has occurred at that point. Over 580,000 fry were hatched and distributed to rearing ponds. Daphnia culture for fish food was quite successful. Some rescue activities were carried on and carp and buffalo eggs were taken in nearby waters, fertilized, and returned to the spawning grounds.

At the Lake Mills, Wis., station construction work has been prosecuted with W. P. A. labor, resulting in the completion of one new large bass pond and five smaller bass ponds, with a circular rearing pond for trout. The production of approximately 70,000 bass, crappie, etc., was a slight advance over the previous year, but below the level at which this station should produce. Activities with trout, involving the distribution of over 200,000 fingerlings, was satisfactory.

At the Rochester, Ind. station W. P. A. workers were engaged throughout the greater part of the year in enlarging the pond system. At Argos, Ind., auxiliary construction work was completed and five ponds were placed in operation. An office building was being constructed at Rochester at the close of the year, supplementing a garage which had been completed earlier. Drought conditions hampered fish-cultural activities and necessitated an early distribution of the fish. Production approximated 400,000 of all species and sizes, the predominant species being largemouth bass.

The Homer, Minn., station was, as heretofore, utilized as a base for certain rescue operations and also as a repair and storage depot for the equipment utilized throughout the Upper Mississippi area.

AQUARIUM

No new developments were initiated in the aquarium located in the basement of the Department of Commerce Building at Washington. However, this establishment was a point of attraction to many thousands of visitors to the city. The demonstration of hatching methods, utilizing live eggs of various species was a point of special attraction, as was the model fish ladder used to demonstrate the

principle of transporting fish over dams. Since collection of specimens from local waters is difficult and expensive, much of the stock used for replenishment in the spring and fall months was obtained from the Bureau's hatcheries.

DISTRIBUTION OPERATIONS

Initial requests for consignments of fish for unstocked waters were received in greater number this year than in any previous year. This was partly due to requests for the stocking of ponds recently constructed by the Department of Agriculture in a program for the prevention of soil erosion. A total of 9,887 applications from individuals and clubs were filled. This does not include the number of blanket applications from the National Forests and National Parks, to which hundreds of thousands of fish were assigned.

The distribution cars, engaged in the delivery of fish to applicants and transfers between hatcheries, this year made 95 trips and carried an average of 250 pails per trip. These cars traveled 50,342 paid miles and 19,331 free miles. Detached messengers traveled 37,712 paid miles and 5,410 free miles in delivering fish to applicants. Truck deliveries during the year aggregated 89,262 miles. The use of trucks for making deliveries of fish within a comparatively short distance of the stations is becoming a more general practice. As in previous years, the Bureau was favored with free transportation or reduced rates by a number of the railroads. Several of the State conservation departments also aided materially in the distribution of fish from our hatcheries to applicants in their respective States by furnishing facilities for this purpose.

Unfortunately, due to limited funds, it was necessary in some localities to request applicants to call at the hatcheries for their consignments of fish. This was not always practicable and in cases where the fish could not be delivered to the applicant at the hatchery the uncalled for fish were either given to other applicants or planted in public waters.

Summary, by States, of the distribution of fish, fiscal year 1937

State and species	Number	State and species	Number
Alabama:		Connecticut:	
Black bass, largemouth	320,564	Brook trout	16,300
Catfish	380	Black bass, smallmouth	289,000
Rainbow trout	28,000	Florida:	
Sunfish	2,037,115	Black bass, largemouth	20,740
Loch Leven trout	10,000	Sunfish	2,625
Arizona:		Georgia:	
Black bass, largemouth	21,400	Black bass, largemouth	355,600
Rainbow trout	30,000	smallmouth	1,250
Sunfish	7,500	Brook trout	2,340
Brook trout	7,500	Catfish	112,025
Arkansas:		Crappie	600
Black bass, largemouth	395,170	Rainbow trout	58,745
smallmouth	15,500	Sunfish	567,345
Rainbow trout	2,809	Idaho:	
Rock bass	32,130	Blackspotted trout	242,300
Sunfish	85,090	Brook trout	148,630
California: Chinook salmon	4,528,360	Loch Leven trout	61,400
Colorado:		Rainbow trout	1,461,320
Black bass, largemouth	2,550	Illinois:	
Blackspotted trout	515,000	Black bass, largemouth	13,170
Brook trout	3,841,300	Buffalo fish	11,000
Lake trout	46,780	Carp	23,000
Loch Leven trout	137,250	Catfish	4,900
Rainbow trout	1,198,690	Crappie	3,675
Sunfish	190	Sunfish	23,400

Summary, by States, of the distribution of fish, fiscal year 1937—Continued

State and species	Number
Illinois—Continued.	
White bass	350
Miscellaneous fishes	5,155
Indiana:	
Black bass, largemouth	265,870
smallmouth	21,640
Catfish	1,120
Crappie	7,180
Rock bass	5,200
Sunfish	89,090
Yellow perch	5,000
Brook trout	129,790
Loch Leven trout	134,250
Rainbow trout	110,750
Iowa:	
Black bass, largemouth	359,470
smallmouth	5,500
Buffalo fish	2,350,700
Carp	919,400
Catfish	15,408,380
Crappie	4,878,665
Drum	43,800
Pike-pickerel	37,530
Rock bass	18,000
Sunfish	6,374,365
White bass	34,575
Yellow perch	55,500
Miscellaneous fishes	1,352,785
Brook trout	9,200
Loch Leven trout	13,000
Rainbow trout	36,350
Kansas:	
Catfish	790
Crappie	7,035
Rainbow trout	445
Sunfish	13,785
Kentucky:	
Black bass, largemouth	14,830
smallmouth	44,485
Crappie	280
Rock bass	4,050
Sunfish	39,300
Louisiana:	
Crappie	1,510
Black bass, largemouth	416,940
Sunfish	54,960
Warmouth bass	5,665
Maine:	
Black bass, smallmouth	24,000
Brook trout	922,530
Landlocked salmon	10,000
Flatfish	731,700,000
Lobster	2,625,000
Maryland:	
Black bass, largemouth	13,305
smallmouth	680
Brook trout	2,750
Loch Leven trout	1,000
Rainbow trout	805
Silver salmon	3,000
Yellow perch	1,871,000
Massachusetts:	
Black bass, smallmouth	195,150
Brook trout	118,650
Catfish	3,375
Cod	162,832,900
Flatfish	564,866,100
Mackerel	8,833,000
Pollock	571,409,650
Michigan:	
Black bass, largemouth	24,275
smallmouth	63,430
Brook trout	718,100
Crappie	2,875
Rainbow trout	231,890
Rock bass	1,600
Sunfish	3,375
Yellow perch	210
Minnesota:	
Black bass, largemouth	106,500
smallmouth	3,105
Brook trout	668,900
Buffalo fish	3,375
Carp	15,775
Minnesota—Continued.	
Catfish	424,800
Crappie	2,675,540
Drum	1,000
Lake trout	178,000
Loch Leven trout	78,200
Pike-perch	9,470,000
Pike-pickerel	9,575
Rainbow trout	71,200
Sunfish	682,090
White bass	83,025
Whitefish	2,595,000
Yellow perch	15,000
Miscellaneous fishes	83,300
Mississippi:	
Black bass, largemouth	339,215
Sunfish	322,625
Missouri:	
Black bass, largemouth	323,410
smallmouth	40,000
Catfish	15,745
Crappie	19,015
Rainbow trout	60,840
Rock bass	56,300
Sunfish	33,795
Montana:	
Black bass, largemouth	60,310
Blackspotted trout	1,030,815
Brook trout	297,815
Catfish	4,780
Crappie	21,590
Grayling	721,810
Loch Leven trout	2,545,130
Rainbow trout	1,368,740
Nebraska:	
Black bass, largemouth	23,725
Brook trout	334,150
Catfish	19,800
Crappie	2,710
Loch Leven trout	82,900
Rainbow trout	175,740
Rock bass	2,000
Sunfish	9,290
Nevada:	
Blackspotted trout	25,000
Brook trout	9,000
New Hampshire:	
Black bass, smallmouth	34,300
Brook trout	1,065,965
Catfish	1,700
Lake trout	21,445
Loch Leven trout	6,000
Rainbow trout	149,400
New Jersey:	
Black bass, largemouth	4,055
Catfish	750
Crappie	225
Flatfish	28,682,000
Sunfish	3,700
New Mexico:	
Black bass, largemouth	584,250
Blackspotted trout	49,000
Brook trout	24,000
Catfish	29,000
Crappie	5,000
Rainbow trout	396,000
Sunfish	303,600
New York:	
Black bass, largemouth	16,000
smallmouth	87,100
Brook trout	616,160
Flatfish	112,526,000
Lake herring	160,000
Lake trout	307,210
Loch Leven trout	103,150
Rainbow trout	158,945
Whitefish	160,000
Yellow perch	2,500,000
North Carolina:	
Black bass, largemouth	449,390
smallmouth	3,180
Brook trout	217,165
Catfish	240
Crappie	940

Summary, by States, of the distribution of fish, fiscal year 1937—Continued

State and species	Number
North Carolina—Continued.	
Glut herring	12,500,000
Rainbow trout	248,315
Shad	6,240,000
Striped bass	641,000
Sunfish	238,140
Warmouth bass	3,100
Yellow perch	85
White perch	2,500,000
North Dakota:	
Black bass, largemouth	71,900
Crappie	9,510
Loch Leven trout	2,000
Ohio:	
Black bass, largemouth	37,800
Catfish	875
Crappie	3,810
Loch Leven trout	15,000
Pike-perch	212,175,000
Rainbow trout	29,925
Rock bass	9,300
Sunfish	36,070
Whitefish	83,500,000
Oklahoma:	
Black bass, largemouth	244,770
Catfish	5,400
Crappie	113,985
Rock bass	3,500
Sunfish	216,595
Warmouth bass	5,800
Oregon:	
Blackspotted trout	98,350
Brook trout	688,000
Black bass	4,500
Chinook salmon	8,078,500
Loch Leven trout	152,800
Rainbow trout	140,220
Silver salmon	1,066,370
Steelhead trout	907,000
Pennsylvania:	
Black bass, largemouth	17,085
smallmouth	3,980
Brook trout	320,880
Catfish	26,100
Crappie	8,805
Loch Leven trout	49,160
Rainbow trout	108,535
Rock bass	1,600
Sunfish	25,120
Yellow perch	630
Rhode Island:	
Flatfish	49,768,000
South Carolina:	
Black bass, largemouth	432,050
Brook trout	63,000
Catfish	2,750
Crappie	9,305
Rainbow trout	21,600
Shad	65,000
Sunfish	258,340
Warmouth bass	9,290
Yellow perch	195
South Dakota:	
Black bass, largemouth	16,670
Blackspotted trout	117,900
Brook trout	55,035
Catfish	42,790
Crappie	18,200
Grayling	5,060
Loch Leven trout	80,650
Rainbow trout	122,660
Rock bass	1,100
Sunfish	34,440
Tennessee:	
Black bass, largemouth	602,615
Brook trout	357,820
Loch Leven trout	33,000
Rainbow trout	347,135
Rock bass	4,830
Sunfish	64,185
Texas:	
Black bass, largemouth	404,845
Catfish	2,305
Crappie	43,435
Sunfish	206,020
Utah:	
Blackspotted trout	309,090
Brook trout	768,350
Lake trout	79,600
Loch Leven trout	181,780
Rainbow trout	578,030
Silver salmon	14,355
Sockeye salmon (landlocked)	98,000
Sunfish	7,500
Vermont:	
Atlantic salmon	10,000
Black bass, smallmouth	16,300
Brook trout	1,415,250
Lake trout	130,640
Landlocked salmon	49,500
Rainbow trout	37,215
Virginia:	
Black bass, largemouth	81,388
smallmouth	23,495
Brook trout	364,675
Catfish	25
Crappie	7,410
Loch Leven trout	8,035
Rainbow trout	279,745
Rock bass	19,900
Shad	12,100,000
Sunfish	74,530
Yellow perch	235,892,500
Washington:	
Black bass, largemouth	25,416
Blackspotted trout	1,140,560
Brook trout	761,525
Chinook salmon	17,282,560
Chum salmon	17,405,500
Crappie	10,105
Golden trout	12,000
Loch Leven trout	162,300
Rainbow trout	627,870
Silver salmon	1,021,215
Sockeye salmon	4,810,500
Steelhead trout	524,060
Sunfish	1,440
West Virginia:	
Black bass, largemouth	4,455
smallmouth	19,290
Brook trout	753,300
Crappie	30
Loch Leven trout	27,950
Rainbow trout	560,105
Rock bass	8,800
Silver salmon	17,110
Sunfish	49,800
Wisconsin:	
Black bass, largemouth	1,098,245
Brook trout	596,000
Buffalo fish	1,295,700
Carp	1,830,400
Catfish	5,072,325
Crappie	1,421,770
Drum	200
Loch Leven trout	262,700
Pike-pickerel	76,050
Rainbow trout	202,100
Sunfish	3,866,890
White bass	26,400
Yellow perch	36,825
Miscellaneous fishes	162,000
Wyoming:	
Black bass, largemouth	71,425
Blackspotted trout	7,564,120
Brook trout	890,335
Catfish	9,900
Crappie	33,745
Grayling	822,650
Lake trout	90,000
Loch Leven trout	553,020
Rainbow trout	622,045
Rock bass	3,200
Sunfish	2,250
Yellow perch	900